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lines and that the same network will eventually reach every valuable portion of the Territory.[1]

MEDICAL SCIENCE AND THE TROPICS

Sir Ronald Ross, to whom it is due, perhaps, more than to any other man that the fame of British tropical schools and of British discoveries in tropical medicine has spread over the world, read a paper with this title at the meeting of the Royal Colonial Institute in London on Jan. 14 last. The paper appears in *United Empire* (Feb., 1913, pp. 120–131) and from it are condensed here some of the statements of this distinguished physician.

Sir Ronald Ross said that those who have not been in tropical countries can scarcely conceive the former conditions of life of the poorer Europeans there, nor imagine what the first pioneers must have suffered. With only poor huts to live in, nothing but the poorest food to eat and surrounded by innumerable insect-carriers of infection, they lived a most dangerous life. The risks of death from tropical diseases were immense. Whole regiments used to be wiped out by yellow fever in the West Indies and by cholera in India. No young man visiting tropical America or Africa could be reasonably certain of life. But European settlements did endure though they were only poor and ramshackle affairs. Vast areas, however, remained almost untouched except by occasional explor-

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[1] The following table is taken from the Commission's Report and gives in concise form the data as to mileage, terminals and gauge of existing railroads in Alaska:

Southeastern Alaska:	
White Pass and Yukon route, Skagway to White Pass (narrow gauge). Terminal at White Horse, Yukon Territory—total mileage, 102 miles	20.4
Yakutat Southern Railroad, Yakutat to Situk River (narrow gauge)	9.0
Copper River: Copper River & Northwestern Railroad, Cordova to Kennicott (standard gauge)	195.0
(The same company has built a few miles of track at Katalla, where the Alaska Pacific Railroad & Terminal Co. has also done some work. At Valdez a few miles of track of the Alaska Home Railroad were laid in 1907, and some work was previously done on the Copper River & Northwestern Railway and on the Valdez & Yukon Railroad.)	
Kenai Peninsula: Alaska Northern Railroad, Seward to a point near head of Turnagain Arm (standard gauge)	71.6
Yukon Basin: Tanana Valley Railroad, Fairbanks and Chena to Chatanika (narrow gauge).	46.0
Seward Peninsula:	
Seward Peninsula Railroad, Nome to Shelton (narrow gauge)	80.0
Paystreak Branch, Seward Peninsula Railroad (narrow gauge)	6.5
Council City & Solomon River Railroad, Council City to Penelope Creek (standard gauge)	32.5
Wild Goose Railroad, Council to Ophir Creek (narrow gauge)	5.0
	466.0

ers. Civilization was repulsed throughout tropical Africa and this phenomenon was chiefly due to the great tropical diseases of the continent.

These diseases are almost as disastrous to the natives as to the immigrant Europeans. Their influence is to reduce the number of natives to so low a figure that the survivors can subsist only in a barbaric state. To believe, one has to see a village in Africa or India full of malaria or sleeping sickness or a town under the pestilence of cholera or plague. Malaria often affects every child, probably kills a large proportion of new-born infants and renders the survivors ill for years. All white visitors to tropical America were almost certain to be attacked by yellow fever and the chances of death were one to four. Perhaps the greatest enemy of all was dysentery, which, in the old days, slaughtered thousands of white men and millions of natives of India, America and all hot countries. Malaria has always been the bane of Africa and India; the Bilharzia parasite of Egypt; and we are acquainted with the ravages of Kala-azar and sleeping sickness. Apart from these more fatal maladies, life is rendered unhealthy by other parasites and by innumerable small maladies such as dengue and sand-fly fever, filariasis, tropical skin diseases and other maladies. While in England the annual death rate is below 20 per 1,000, throughout the tropics it is nearer 40 per 1,000. In India alone, malaria kills over 1,000,000 persons a year and dysentery kills many hundreds of thousands. There are places in which the ordinary death rate is between 50 and 60 per 1,000 and other places so unhealthful that their inhabitants desert them.

But tropical medicine and bacteriology are doing away with these horrors. The seeds of tropical medicine were really contained in the works of parasitologists laboring in Italy and Germany during the past three centuries—often laboring entirely unknown to the public. Studying the larger parasites of man and animals they were gradually led to that remarkable law according to which many parasites are transferred from one individual to another by the agency of intermediary hosts. Our recent advance regarding the route of infection in the great tropical diseases has largely been merely an extension of this law. The whole history of the subject is fascinating to the man of science, though it has never yet been written. We see on the one hand the pioneer labors of these European workers, and on the other hand the pioneer labors of hundreds of medical men serving in the tropics who for some centuries described and differentiated the diseases which they were called upon to treat. Gradually the two streams of investigation coalesced with the result that the diseases differentiated by the doctors were explained by the researches of the parasitologists. The culminating period of advance has been within the last thirty years.

Malaria has been shown to be due to a minute animal parasite which is conveyed from man to man by Anopheline mosquitos. Filariasis has been shown to be carried by another group of mosquitos; while yellow fever and dengue, though their actual cause has not yet been certainly ascertained, have been proved to be communicable by a third group of these insects. Sleeping sickness is caused by other species of parasites, and is carried by a species of tsetse-flies. Dysentery has been shown to be of two kinds—a bacillary and an amœbic dysentery. The group of relapsing fevers has been shown to be caused by a third group of parasites, and often to be carried by ticks. The bacillary causes of cholera, Mediterranean fever, and plague have been definitely ascertained, and the great discoveries have been made that the last is communicated by the rat flea, and that Mediterranean fever is communicated by goat's milk. Yet another group of parasites causes the deadly kala-azar of India, and the famous Aleppo boil of Persia. Every year sees fresh advances; but, still more, our methods of diagnosis have now been rendered so precise that many of these diseases are being found where previously they were not known to exist—for instance, kala-azar in Algeria and Italy, and Mediterranean fever in many parts of the world. At the same time invaluable discoveries have been made regarding non-parasitic diseases, such as beri-beri, which has been shown to be due to the absence of some chemical element in the food, and which is essential to the nervous system; while, lastly, numerous and patient researches are now being made as to the whole theory of immunity in these diseases and the best method of cure. Is not all this knowledge a great gift to the human race?

Sir Ronald Ross mentions a number of places in the tropics where health has been vastly improved within the last few years. Up to 1902 the small town of Ismailia near the Suez Canal was almost paralyzed by malaria, more than 1,000 cases occurring annually in the small population. In that year, active steps were taken against the disease in the light of the new knowledge with the result that malaria has been absolutely and permanently banished from the place. The results were scarcely less brilliant in certain towns in the Federated Malay States which were completely rid of the incubus from which they had suffered so much. When Sir

Ronald Ross was at Panama in 1904 the British Consul told him that while the French were attempting to dig the Canal they lost at least 50,000 lives from the prevalent diseases, chiefly malaria and yellow fever. We know now that the death rate in the Canal Zone has actually been reduced below that of many of the United States. Many who have visited the Isthmus have testified to the wonderful transformation. Dr. David Thompson wrote to Sir Ronald from the hospital at Ancon, the capital of the Canal Zone, that the sanitary work consisted simply of carrying out the principles Sir Ronald had laid down—screening houses, draining ditches and streams, treating large patches of water with larvicide and petroleum. The work is carried on constantly all along the line of the Canal. The effect has been marvellous. In Ancon there are no mosquitos and they are exceptionally scarce everywhere. Malaria is now nearly a thing of the past. Mild cases only occur and they are nearly all cases of relapse due to insufficient quinine treatment. "With regard to the climate here it is, in my opinion, much less dangerous than the English winter. Yellow fever and malaria are practically eliminated."

When Sir Ronald was in the Island of Mauritius in 1908 malaria was making terrible havoc in a large village and among British troops living in barracks near by. The neighboring marsh was completely drained at a cost of $10,000 and the result has been the complete extermination of the disease. Mediterranean fever among the troops and sailors in Malta and among peasantry in parts of southern France has been exterminated. Sleeping sickness in Uganda has been reduced. Instance of small campaigns might be multiplied by the score. The vital statistics of non-native officials in West Africa for 1911 show that the total death rate has fallen wonderfully from 1903 to 1911, while the custom of invaliding white men home has practically ceased.

Such facts mean civilization and prosperity for vast possessions in the tropics; and the brilliant results thus far attained are only stimulating further study. Sanitation is no longer relegated to the last position in public affairs. Congresses and conferences are held; commissions of inquiry are appointed; investigations are carried out; and more adequate funds are given. The end will be one of the greatest triumphs of human science. A poet who was much despised in his time, namely Martin Tupper, wrote a magnificent line about Columbus, in which he said that "He gave to man the god-like gift of half a world." Perhaps a day will come when the same thing will be said of tropical medical science.